E-Guardian 5, 8, 10 and 12

Installation Instructions

Espar Heater Systems

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HYDRONIC **D5 25 2823 25 0500**
HYDRONIC **MII 8 25 2824 70 0800**
HYDRONIC **MII 10 25 2824 34 1000**
HYDRONIC **MII 12 25 2824 72 1200**

P/N 20 2900 80 1000 0B 09.2008 Subject to Change Printed in Canada

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Special Notes

Note: Highlight areas requiring special attention or clarification.

Caution: *Indicates that personal injury or damage to equipment may occur unless specific guidelines are followed.*

Warning: Indicates that serious or fatal injury may result if specific guidelines are not followed.

Heater Warnings

Warning To Installer

- Correct installation of this heater is necessary to ensure safe and proper operation.
  Read and understand this manual before attempting to install the heater. Failure to follow all these instructions could cause serious or fatal injury.

Warning - Explosion Hazard

- Heater must be turned off while re-fueling.
- Do not install heater in enclosed areas where combustible fumes may be present.
- Do not install heaters in engine compartments of gasoline powered boats.

Warning - Fire Hazard

- Install the exhaust system so it will maintain a minimum distance of 50mm (2”) from any flammable or heat sensitive material.
- Ensure that the fuel system is intact and there are no leaks.

Warning - Asphyxiation Hazard

- Route the heater exhaust so that exhaust fumes cannot enter any passenger compartments.
- If running exhaust components through an enclosed compartment, ensure that it is vented to the outside.

Warning - Safety Hazard on Coolant Heaters Used With Improper Antifreeze Mixtures

- The use of Espar coolant heaters requires that the coolant in the system to be heated contain a proper mixture of water and antifreeze to prevent coolant from freezing or slushing.
- If the coolant becomes slushy or frozen, the heater’s coolant pump cannot move the coolant causing a blockage of the circulating system. Once this occurs, pressure will build up rapidly in the heater and the coolant hose will either burst or blow off at the connection point to the heater.
- This situation could cause engine damage and/or personal injury. Extreme care should be taken to ensure a proper mixture of water and antifreeze is used in the coolant system.
- Refer to the engine manufacturer’s or coolant manufacturer’s recommendations for your specific requirements.

Caution: *During electrical welding work on the vehicle disconnect the power to the heater in order to protect the control unit.*

Note: All measurements contained in this manual contain metric and approximate SAE equivalents in brackets eg 25mm (1”).

Direct questions to Espar Heater Systems:

Canada & U.S.A. **1-800-387-4800**

This publication was correct at the time of print. However, Espar has a policy of continuous improvement and reserves the right to amend any specifications without prior notice.

E-Guardian 5

The *Hydronic* 5 Coolant Heater preheats bus engines, eliminating cold starts and the need to idle before and during normal bus routes.

- Eliminates the need for an electrical block heater.
- Stops white smoke and reduces emissions on start up.
- Supplemental interior heating.
- Strong heat output of 17,000 BTU/h.
- Compact design.
- Frame rail or engine mount.
- Diagnostic capabilities.

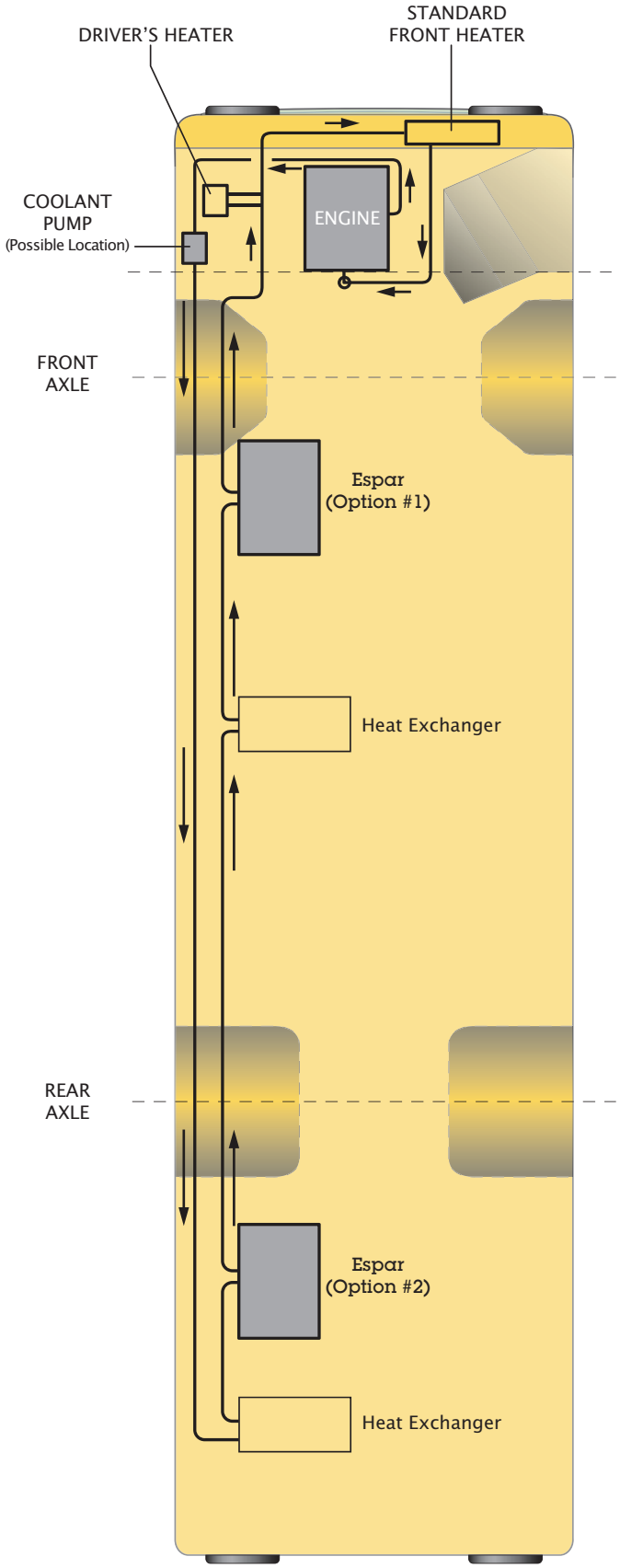
E-Guardian 8,10 and 12

The *Hydronic* "M" Series Coolant Heater is offered in 8, 10 and 12 kw versions to meet the needs and requirements of all enviroments.

- Preheats the engine to eliminate cold starts and extends engine life.
- Accelerates and maintains window defrosting and defogging.
- Provides supplemental heat for increased driver and passenger comfort.
- Stops white smoke at engine start-up and eliminates diesel knock.
- High capacity water pump for increased heat distribution.
- 1 inch coolant connections.

E-Guardian Coolant Heaters go to work before the driver arrives, preheating the coolant in the engine and eliminating cold starts as well as offering supplemental heat to the interior. The heater is mounted on the driverside frame rail and plumbed in series to the 1" coolant lines.

Mounting the E-Guardian



CAREFULLY READ AND UNDERSTAND THE FOLLOWING INSTRUCTIONS BEFORE PROCEEDING WITH THE INSTALLATION.

Mounting the Heater:

1. Find a suitable mounting spot on the frame rail.
Note: Make sure there is enough clearance to remove the lid off the boxed heater before securing the mounting tray.
See page #5.

⚠ Try to use existing holes in the frame rail before drilling.

2. Solidly bolt the mounting tray onto the frame rail.

3. You can then mount the boxed heater on the mounting bracket/tray. Tighten and secure with the lock washers and nuts.

⚠ Check local and state codes to see requirements for mounting the exhaust. In New York State the exhaust MUST exit out the rear of the bus. We supply 2 meters (6 ft.) of flexible stainless steel exhaust.

Integrating into the Coolant System:

A series heating system works in this fashion:
Heated coolant from the engine travels through the first heater core in the circuit, then on to the next heater core in the circuit, and on to the next, etc. Each core adds some restriction, resulting in decreased coolant flow. Not only is coolant flow reduced, but also coolant temperature is reduced by each successive heater core resulting in the last core receiving water that is usually to cool to be effective. The Espar fuel operated heater is equipped with a high capacity coolant pump which increases flow and significantly increase the available heat supplied to a series plumbed system.

1. Remove the radiator cap and release system pressure.

2. Close the shut off valves for the heating system, if so equipped.

3. Two 90 degree elbows have been provided for making connections into the existing coolant lines. To Install:

- Remove heater hose access cover(s) running down the left side of the floor inside the bus at a location over top of the heater installation.

- Find and identify heating circuit supply hose. This is the hose you will use to plumb the Espar heater into the system.

• Locate and mark suitable location on floor where the brass elbows will be installed.

• Once you are satisfied with the location, making certain there are no obstructions, you can now bore 2 holes 32mm (1-1/4") through the floor.

• From inside the bus, drop the elbows down through the floor and align with the heating circuit supply hose, inlet elbow pointing forward and outlet elbow rear ward.

6. From inside the bus cut the previously identified heating supply hose at a point where it can be connected to the inlet and outlet elbows! Use hose clamping pliers to secure the hose before cutting.

7. Connect the heater supply line running from the engine to the inlet elbow. Connect the other cut end of the supply line to the outlet elbow.

8. Secure all hose connections with hose clamps.

⚠ If the bus has silicone coolant lines you must use con stant torque hose clamps to prevent leaks.

9. Remove hose clamping pliers and/or open shut off valves.

10. Top off engine coolant as per engine manufacturers recommendations and re-install radiator cap.

⚠ Do not install the previously removed eater hose access covers at this time. Hose connections will require insspection and re-tightening of clamps once installation is complete and tested.

Fuel System

The fuel pick up pipe and fuel line must be installed according to these instructions to ensure proper operation.

1. Locate the cover plate on the floor of the school bus above the fuel tank.

2. Drill holes on the plate of the tank as shown in the installation manual that is included.

3. Cut the fuel pick up pipe to length, approx. one inch off the fuel tank bottom. Cut standpipe end on a 45 degree angle to prevent clogging.

4. Install as shown in manual.

5. Route and secure fuel line from heater to fuel tank. Do not route fuel line over frame rails, always route through or under frame rail.

Routing Harness

1. The wiring harness has 40 ft. of control/timer line, 30 ft. of battery line and 25 ft of fuel pump line. Cut any excess wire after running it to the desired location as to avoid coiling extra harness.

⚠ The installation kit includes 30 ft. of loom for the battery line.

2. Route and secure the battery line from the Espar heater to battery and cut harness to length.

3. Secure the 20 amp fuse to the positive (Red) line and connect it to the positive lead.

4. Connect ground lead to ground stud on battery.

5. Route and secure the control/timer line to either the control panel on the outside of the bus or the driver's compartment.

6. Route the fuel pump line along with the clear plastic fuel line to the pump.

Initial Operation

1. Check your installation for:

• All fasteners are secure
• Exhaust pipe routing and clamp tightness
• Loose hose clamps
• Routing and securing of wiring and heater hoses
• Kinked or pinched hoses
• Battery connection and polarity

2. Top off or refill coolant.

3. Open shut-off valves and driver's heater valve.

4. Start the vehicle engine and run it at a fast idle for 10 minutes to purge air from the Espar coolant heater and all of the heat exchangers. While the engine is running check.

• Hose connections for leaks.
• Coolant level in the expansion tank and add coolant as needed.

5. Switch on heater.

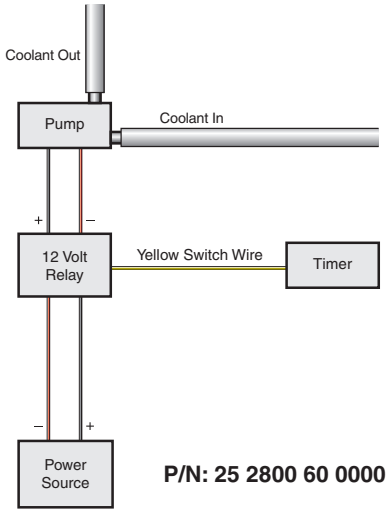
6. Shut off engine.

> ⚠ Installations with long fuel lines may require a second or third attempt to prime the fuel system. The heater will make 2 start attempts and run through a cool down cycle before shutting down. Cycle the timer switch off and on to reset the control unit and restart the heater. You should be able to hear the fuel pump ticking as it is trying to prime the line.

7. Switch heater off

8. Install any panels and access covers removed during installation.

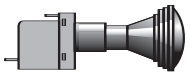
Coolant Pump Kit

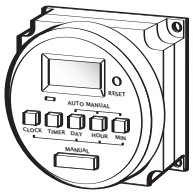


P/N: 25 2800 60 0000

Control Options

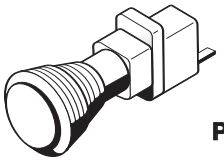
A Push/Pull switch, a 7 Day Timer or a Programmable Timer are available.





Push/Pull Switch

- Mount switch in a location where it is easily accessible.
- Mount using hardware supplied.
- Connect the switch harness to the connector at the heater and run the harness to the switch location.
- Cut harness to length at the switch and install terminals.
- Connect wiring as shown.



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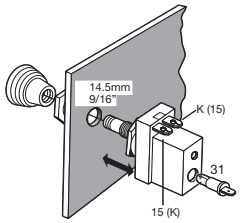


Control Wiring Push/Pull Switch

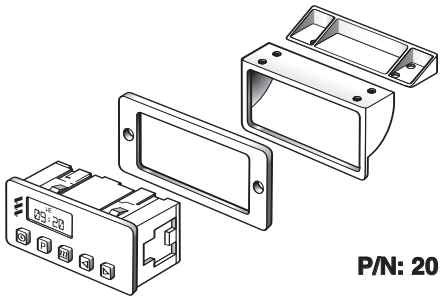
Brown- 31	Power from battery "-"
Red- K(15)	Power from battery "+"
Yellow-15(K)	Switch control to the heater
Blue/White	Diagnostic from heater (disregard - tape end and tie off to the side)

Note: Wired as above the switch light glows when pulled out and is off when pushed in.

7 Day Timer

The 7 Day Timer is capable of multiple start functions within a 7 day period. Other functions include current time display and AM automatic heater numeric fault code. Display refer to instructions provided with timer for setting options.

- Mount timer and bracket in a suitable location.
- Connect the switch harness to the connector at the heater and run the harness to the control location.
- Cut harness to length at the control and install terminals.
- Connect switch harness to timer as shown below.
- Refer to timer instructions for other wiring options.



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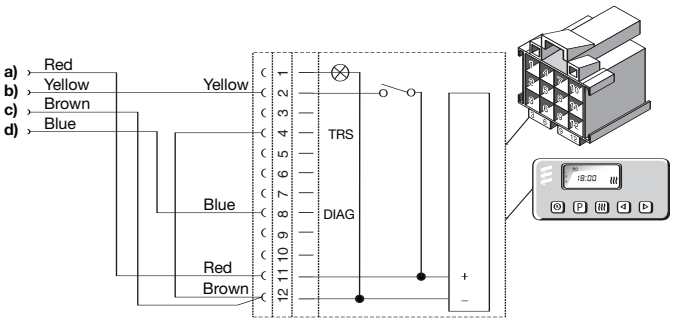
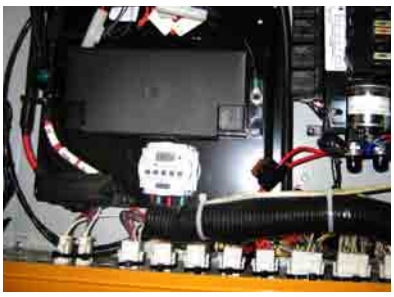


a) Power from battery "+".
b) Switch control to the heater.
c) Power from battery "-".
d) Diagnostic from heater.

Option #1: Dash lights to timer - connect wire between dash lights circuit and timer at terminal #1.

Option #2: Operate heater continuously - connect wire from ignition circuit to terminal #10.
See also multifunction (7 day) timer in instructions.

Programmable Timer



12 Volt P/N: 5670100

Before using your timer, please read the following instructions carefully.
This quality product has been tested and certified to meet the CE and GS safety requirement.

IMPORTANT: This electronic timer has a maximum loading printed on the rating label and under no circumstances should this be exceeded.

Features

- Up to 8 ON and OFF switches a day/56 ON and OFF switches per week
- Option to program individual days or 8 different weekday groups
- Minimum switching period of one minute
- Summer/Winter time changeover
- Easy to read LCD display
- Manual Override button
- Battery Back-up

IMPORTANT: As soon as you have connected 12 volts you will have to push down the RESET button to activate the timer.

Setting the Time

Press and hold the CLOCK button. Then press on the DAY button to select the correct day, then the HOUR button to select the correct hour and the MIN button to select the correct minutes.
When the MIN button is released, the time will be set and the seconds will be starting from 00.
Either holding down or repeatedly pressing the appropriate button can advance the days, hours and minutes.

Programming of Switching Times

The Auto Time Switch has the capacity for 8 ON/OFF switches. By using the blocks of days available, you can save program capacity. The block days are:

MO, TU, WE, TH, FR, SA, SU – Individual days of the week
MO, TU, WE, TH, FR
SA, SU
MO, TU, WE, TH, FR, SA
MO, WE, FR
TU, TH, SA
MO, TU, WE
TH, FR, SA

For each ON time and each OFF time, the days, hours and minutes must be set.
Press the TIMER button once to set the first ON time – you will see "on" and the number "1" appears on the left of the LCD display. This indicates that you can now enter the first ON time. Press the DAY button to choose the required day or block of days, and then set the hour and minutes using the HOUR and MIN buttons.
When you have completed setting the required ON time, press on the TIMER button to validate the entry and move onto the first OFF time you will see "OFF" and the number "1" appear on the left of the LCD display. This indicates that you can now enter the first OFF time by using the DAY, HOUR and MIN buttons as above.
Press the TIMER button to validate this entry.
Repeat the same steps for the remaining 7 ON and OFF settings as desired.
When you have set the required ON/OFF settings, press the CLOCK button to return the display to the clock. The timer will now be ready to operate.
Note that you can check the settings you have programmed by pressing the TIMER button repeatedly – each setting will appear on the screen.

Manual Override

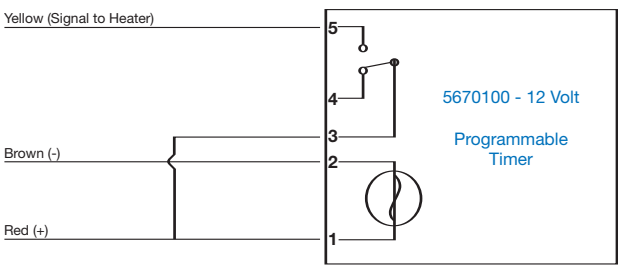
You can choose permanent Manual ON, permanent Manual OFF, Auto mode ON and Auto OFF by pressing the MANUAL button. When you choose Auto mode ON, the timer turns on until the OFF time is programmed. The program settings will only work in Auto mode. When Auto mode OFF is chosen the timer is OFF until the next program is activated.

Switchover Summertime/Wintertime, Time Zone Change

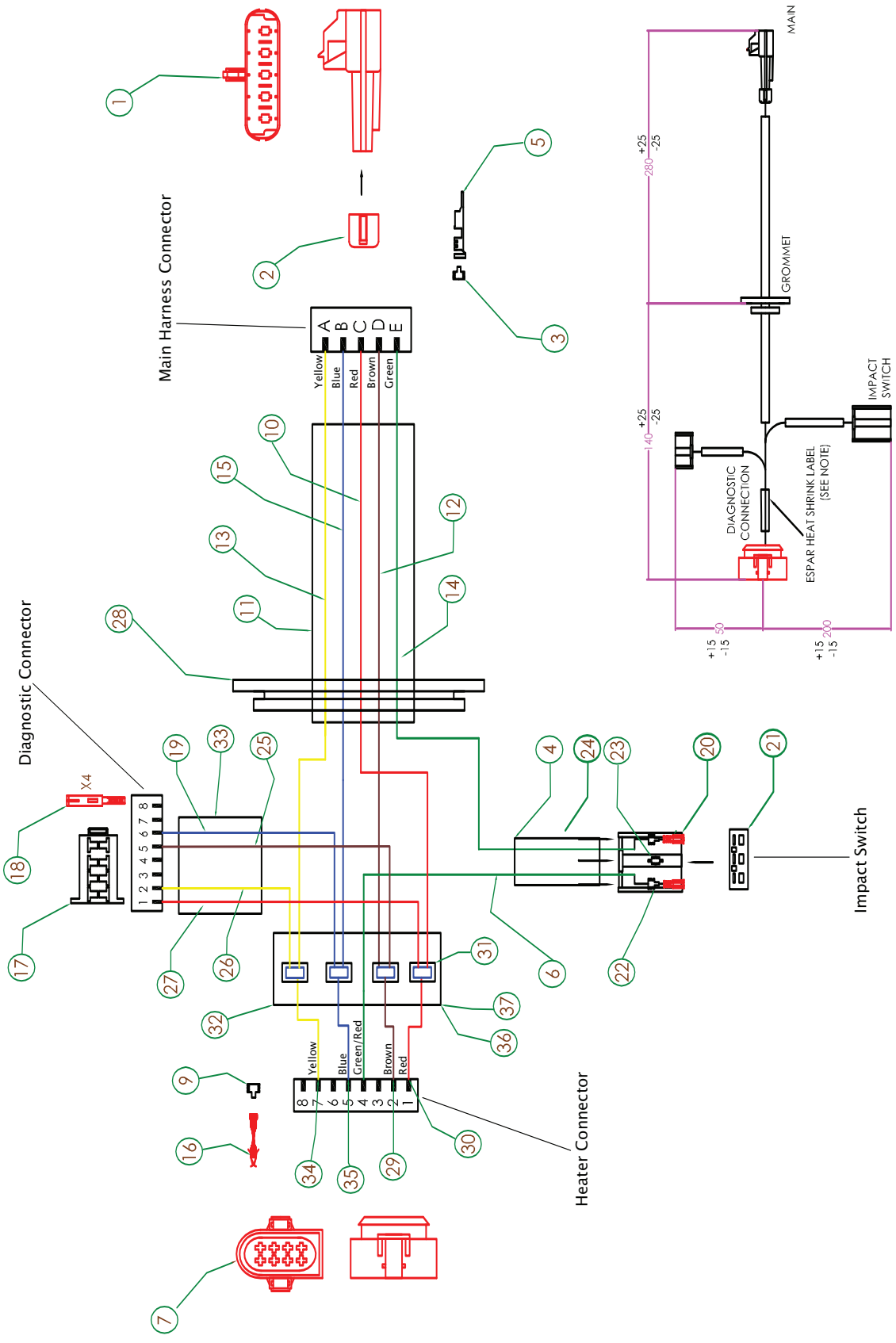
To change from wintertime to summer time press the HOUR and MIN buttons simultaneously.
The clock will be set forward one hour and an "S" will appear on the display. Repeat the same procedure in order to select wintertime.

Reset Button

To reset the unit including the time and programmed ON/OFF settings, press the RESET button using a ballpoint pen.



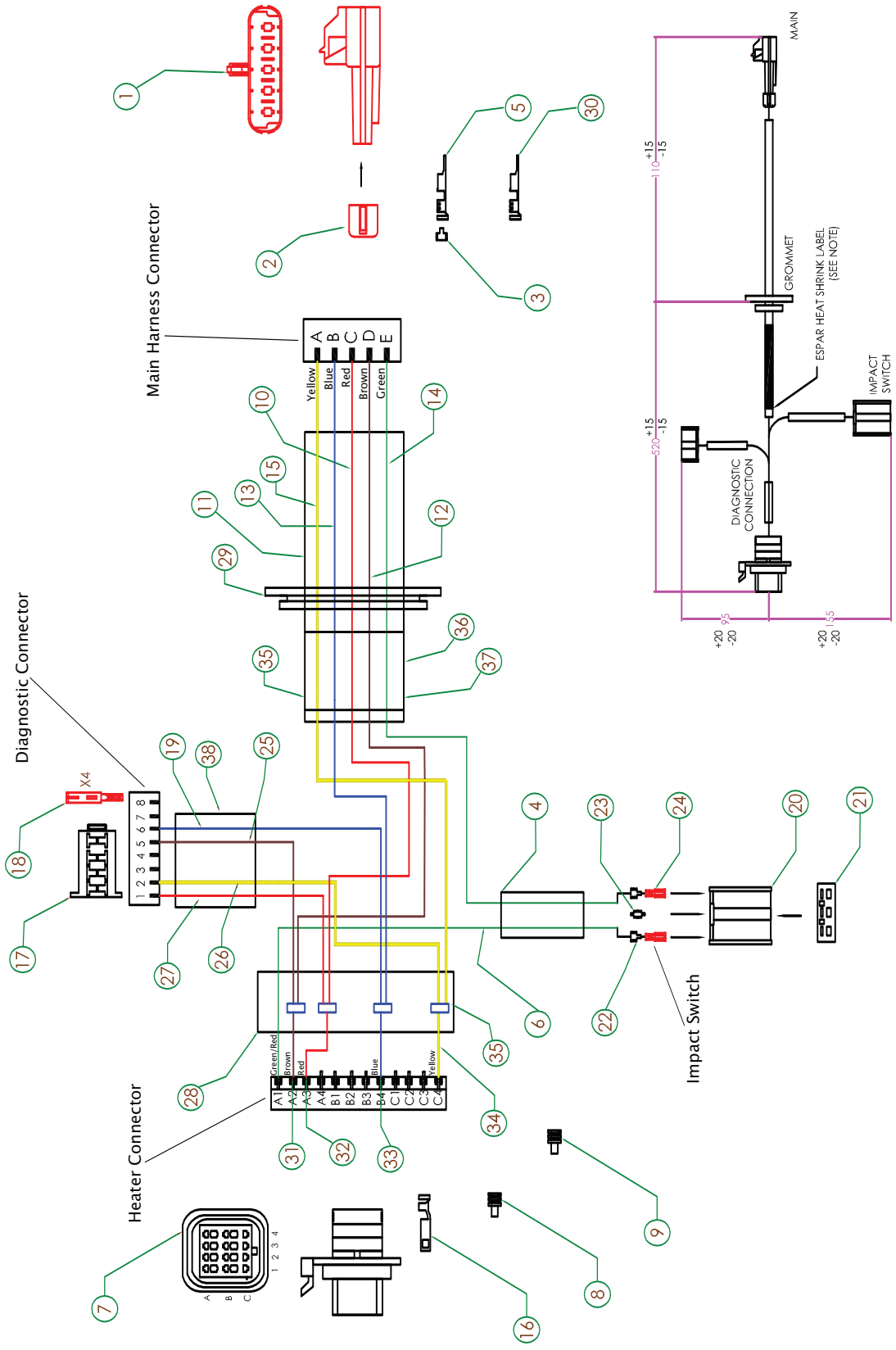
Schematic: Hydronic 5 Harness Adaptor



Schematic: Hydronic 5 Harness Adaptor

BILL OF MATERIAL					
ITEM NO.	PART NUMBER	DESCRIPTION	QTY (EA)	QTY (FT)	QTY (mm)
1	5670372	Housing 5H P/P	1		
2	5670373	Housing Lock 5H P/P	1		
3	56702819	Housing Seal	5		
4	20.2900.70.5917	Insulating PVC Tube 1/4 In			400
5	5670180	Terminal M-P/P	5		
6	5670115	Wire. TR64 AWG 16 Green/Red			320
7	20600094	VW Oval 8 Hole Housing M D4/D5	1		
	5670348	Plug Red P/P	3		
9	5670298	Housing Seal Red	5		
10		14 AWG SAE Spec TXL Red			360
11		Insulating PVC Tube $\frac{5}{16}$"			320
12		14 AWG SAE Spec TXL Brown			360
13		16 AWG SAE Spec TXL Yellow			360
14		16 AWG SAE Spec TXL Green			360
15		16 AWG SAE Spec TXL Blue			360
16	5670226	Terminal Mini FE AWG 14-18	5		
17	206 31 298	Socket 8 Pin Mini Connector	1		
18	206 00 180	Mini Terminal AWG 16 - 20	1		
19	5670164	Wire AWG 22 Blue/White			130
20	25.2731.70.0004	3 Way Recp Housing Assy Eco	1		
21	25.2731.70.0005	Lock 070 E-J MK-2 + Plug	1		
22	25.2731.70.0012	Seal E-J MK-2 070 Rubber Plug	2		
23	25.2731.70.0008	Plug E-J MK-2 Cavity Plug	1		
24	25.2731.70.0011	Terminal FE E-J MK-2 070 Recep	2		
25	5670163	Wire AWG 22 Brown			130
26	20.2900.70.5917	Wire AWG 22 Yellow			130
27	5670162	Wire AWG 22 Red			130
28	20.1280.09.0103	Grommet	1		
29		12 AWG SAE Spec TXL Brown			65
30		12AWG SAE Spec Red			65
31	20.2900.70.5913	Shrink Tube 1/4			20
32		Adhensive Lined Heat Shrink			80
33	20.2900.70.5917	Insulating PVC Tube 1/4			85
34		14 AWG SAE Spec TXL Yellow			65
35		16 AWG SAE Spec TXL Blue			65
36		Custom Heat Shrink			52
37		Clear Heat Shrink Tubing			65

Schematic: Hydronic M-II / 8-10-12 Harness Adaptor

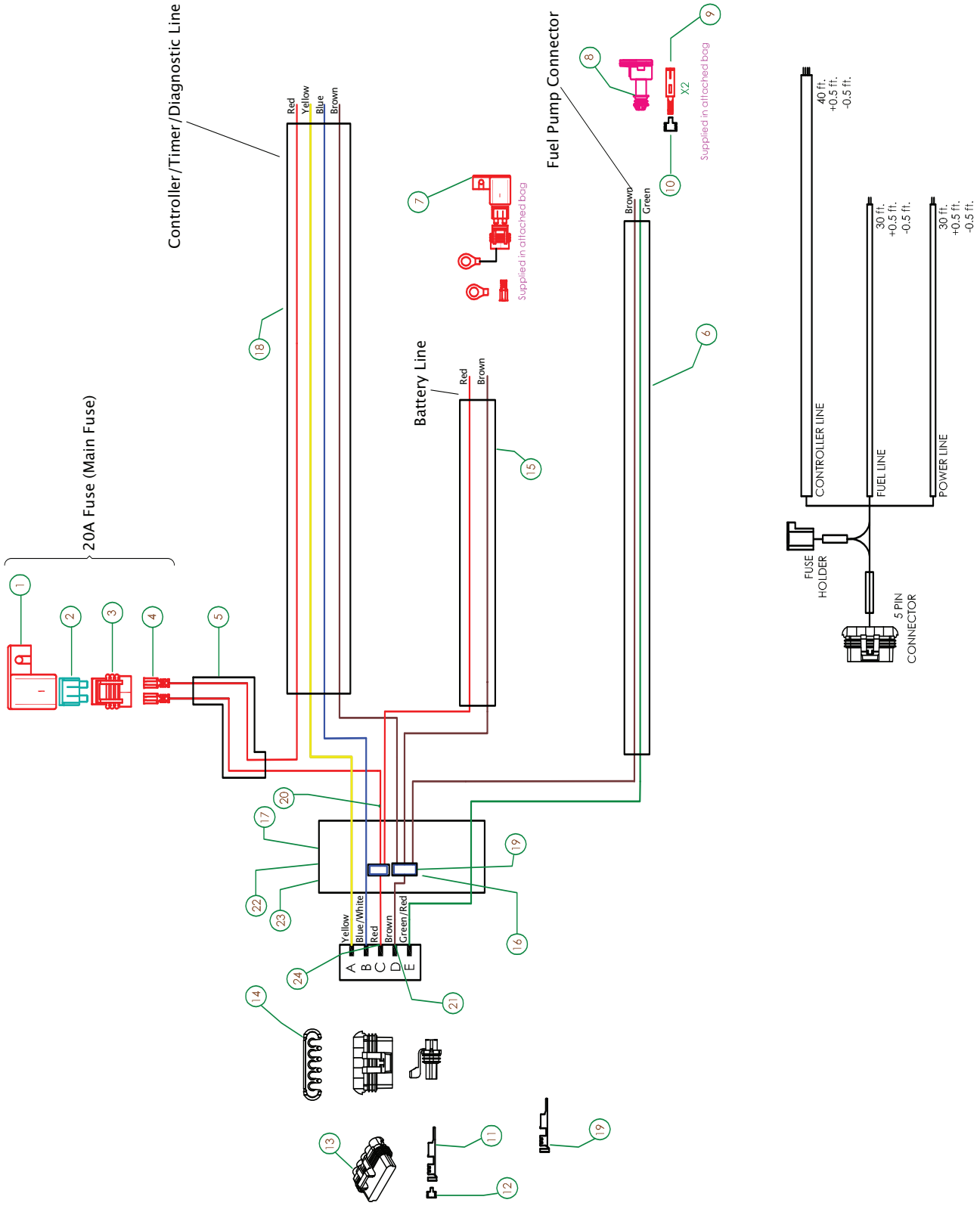


Schematic: Hydronic M-II / 8-10-12 Harness Adaptor

BILL OF MATERIAL

ITEM NO.	PART NUMBER	DESCRIPTION	QTY (EA)	QTY (FT)	QTY (mm)
1	5670372	Housing 5H P/P	1		
2	5670373	Housing Lock 5H P/P	1		
3	5670281	Housing Seal	5		
4	20.2900.70.5917	Insulating PVC Tube $\frac{1}{4}$"			100
5	5670180	Terminal M-P/P	3		
6		16 AWG SAE Spec TXL Green/Red			550
7	206.31.319	Socket Housing M Stribe CTRL	1		
8	206.75.042	Plug for 206.31.319 Stribe	7		
9	206.75.040	Wire Seal Stribe AWG 16	5		
10		12 AWG SAE Spec TXL			630
11		Insulating PVC Tube $\frac{5}{16}$"			120
12		12 AWG SAE Spec TXL			630
13		16 AWG SAE Spec TXL			630
14		16 AWG SAE Spec TXL			520
15		16 AWG SAE Spec TXL			630
16	206.36.154	Terminal Stribe AWG 16	5		
17	206 31 298	Socket 8 Pin Min Connector	1		
18	206 00 180	Min Terminal AWG 16 - 20	4		
19	5670164	Wire AWG 22 Blue/White			470
20	25.2731.70.0004	3 Way Recp Housing Assy Eco	1		
21	25.2731.70.0005	Lock 070 E-J MK-2 + Plug	1		
22	25.2731.70.0012	Seal E-J MK-2 070 Rubber Plug	2		
23	25.2731.70.0008	Plug E-J MK-2 Cavity Plug	1		
24	25.2731.70.0011	Terminal FE E-J MK-2 070 Recep	2		
25	5670163	Wire AWG 22 Brown			470
26	20.2900.70.5917	Wire AWG 22 Yellow			470
27	5670162	Wire AWG 22 Red			470
28	201.31.068	$\frac{1}{2}$" INSULATION TUBE			365
29	20.1280.09.0103	Grommet	1		
30		Terminal MP/P	2		
31		14 AWG SAE Spec TXL Brown			77
32		14 AWG SAE Spec TXL Red			102
33		16 AWG SAE Spec TXL Blue			51
34		16 AWG SAE Spec TXL Yellow			127
35		$\frac{3}{16}$" Adhensive Lined heat Shrink			127
36	25.2800.70.1002	Custom Heat Shrink	1		
37		Clear Heat Shrink Tubing			58
38	202900.70.5917	Insulating PVC Tube			95

Schematic: Hydronic 5 and M-II / 8-10-12 Main Harness



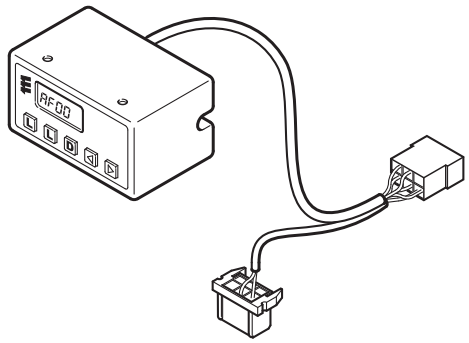
Schematic: Hydronic 5 and M-II / 8-10-12 Main Harness

BILL OF MATERIAL

ITEM NO.	PART NUMBER	DESCRIPTION	QTY (EA)	QTY (FT)	QTY (mm)
1	20.2900.60.7009	Fuse Cover	1		
2	20400079	Fuse 5 A	1		
3	20.2900.70.7017	Fuse Holder Base	1		
4	5670199	Fuse Terminals	2		
5	20.2900.70.5917	PVC Tube 1/4			25
6	20.2900.70.0915	Cable 2 Core AWG 16		30	
7	20.2900.70.0920	Power Pigtail 12 Volt	1		
8	206 31 290	Socket 2 Hole w/Spring	1		
9	206 00 182	Mini Terminal AWG 14 - 18	3		
10	5670298	Housing Seal	2		
11		Terminal	3		
12		Seal	5		
13		Female 5 Pin Connector	1		
14		5 Pin Housing Lock	1		
15	20.2900.70.5923	Cable Core 2 AWG 12		30	
16	20.2900.70.5913	Shrink Tube $\frac{1}{4}$"		30	
17	20.2900.70.5914	PVC Tube $\frac{1}{2}$"			15
18	20.2900.70.0913	Cable 4 Core AWG 18		40	
19		Termial	2		
20	5670103	Wire AWG 18 RED			140
21		14 AWG SAE Spec TXL BROWN			110
22	25.2800.70.1002	Custom Heat Shrink			50
23		Clear Heat Shrink			65
24		14 AWG SAE Spec TXL RED			110

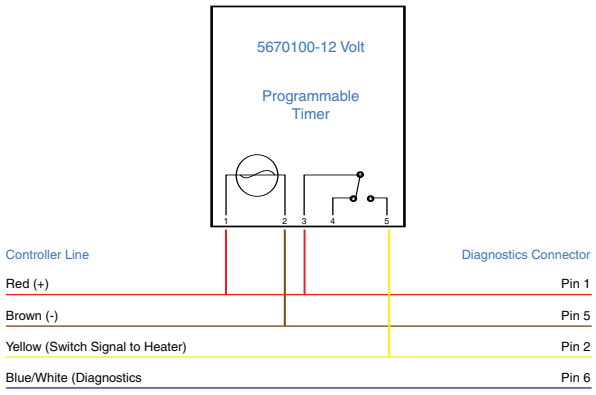
Diagnostics and Troubleshooting

There is a diagnostics connector located on the wiring harness inside the boxed Hydronic unit. If the heater experiences any difficultly starting or shuts down during operation the mechanic can plug in their diagnostics unit and read the fault codes off the control unit of the heater. Instructions are included with the diagnostics unit and the fault codes are listed in your Hydronic M service manual. The diagnostics unit is sold separately. PN 20.2900.7050.20



Wiring

Espar has also included the added convenience of wiring an additional diagnostics connector close to the controller/timer during installation. The installer will need to cut off approximately 1 ft. of the control line and use that to connect the controller/timer to the diagnostics connector. The terminals and connector have been provided in the bag parts.



2nd Printing - Sept 2008
Printed in Canada
P/N: 20 2900 80 1000 0B

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